Glossary

Matrix

A rectangular layout or a formation of a collection of real numbers, say 0, 1,2, 1 3, 4 and 7, such as;

$\begin{matrix} 1 & 3 & 4 \\ 7 & 2 & 0 \end{matrix}$ and then enclosed by brackets '[ ]' is said to form a matrix $\begin{bmatrix} 1 & 3 & 4 \\ 7 & 2 & 0 \end{bmatrix}$

Rectangular Matrix

A matrix M is called rectangular if, the number of rows of M ≠ the number of columns of M.

Square Matrix

A matrix M is called a square matrix if, the number of rows of M = the number of columns of M.

Row Matrix

A matrix M is called a row matrix if M has only one row.

Column Matrix

A matrix M is called a column matrix if M has only one column.

Null or Zero Matrix

A matrix M is called a null or zero matrix if each of its entries is 0.

Transpose of a Matrix

Let A be a matrix. The matrix A^t is a new matrix which is called transpose of matrix A and is obtained by interchanging rows of A into its respective columns (or columns into respective rows).

Symmetric Matrix

A square matrix M is called symmetric if $M^t = M$.

Negative of a Matrix

Let A be a matrix. Then its negative, -A is obtained by changing the signs of all the entries of A.

Skew Symmetric Matrix

A square matrix M is said to be skew symmetric if $M^t = -M$.

Diagonal Matrix

A square matrix M of the type $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ is called a diagonal matrix of order 3-by-3, where all the three entries a, b, c are not same.

Scalar Matrix

A square matrix M is called a scalar matrix of order 3-by-3, if it is of the type $\begin{bmatrix} k & 0 & 0 \\ 0 & k & 0 \\ 0 & 0 & k \end{bmatrix}$ where the scalar $k \neq 0, 1$

Identity Matrix

A square matrix of the type

$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is called a 3-by-3 identity matrix.

Additive Identity of a Matrix

Let $A = \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$ be a matrix of order 2-by-3. Then a matrix B is said to be an additive identity of matrix A, if,

$$B + A = A = A + B$$

Additive Inverse of a Matrix

Let A be a matrix of order 3-by-3. A matrix B is defined as an additive inverse of A if $B + A = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} = A + B$

Multiplicative Identity of a Matrix

Let A be a matrix. Another matrix B is called the identity matrix of A under multiplication if BA = A = AB.

Determinant of a 2-by-2 Matrix

Let $M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, be a 2-by-2 matrix. A real number λ is called determinant of M, denoted by det M such that

$$\det M = \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

Singular Matrix

A square matrix M is called singular if the determinant of M is equal to zero.

Non-Singular Matrix

A square matrix M is called non-singular if the determinant of M is not equal to zero (i.e., M is not singular).

Adjoint of a Matrix

Given a matrix M = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, adjoint of M is defined by

Adj M = $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

Inverse of a Matrix

Let M be a square matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$

(1) Write adjoint of matrix M

(2) Multiply by $\frac{1}{\det M}$ to the Adjoint (M)

The desired inverse of M is obtained as

$M^{-1} = \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ where det M = ad - bc≠ 0

The Set of Real Numbers

R = union of two disjoint sets (the set of rational numbers Q and the set of irrational numbers Q'),

i.e., R = Q ∪ Q'

nth Root of "a"

If n is a positive integer greater than 1 and a is a real number, then any real number x such that $x^n = a$ is called the nth root of a, and in symbols is written as

$x = \sqrt[n]{a}$ **(radical form)**

or $x = (a)^{1/n}$, **(exponential form)**

In the radical $\sqrt[n]{a}$, the symbol $\sqrt{\ }$ is called the radical sign, n is called the index of the radical and the real number a under the radical sign is called the radicand or base.

Complex Number

A number of the form $z = a + bi$ where 'a' and 'b' are real numbers and $i = \sqrt{-1}$, is called a complex number

Complex Conjugate

The numbers $a + bi$ and $a - bi$ are conjugate of each other.

Scientific Notation

A number written in the form $a \times 10^n$, where $1 \leq a < 10$ and n is an integer, is called the scientific notation.

Logarithm of a Number

If $a^x = y$ then x is called the logarithm of y to the base 'a' and is written as $\log_a y = x$, where $a > 0$, $a \neq 1$ and $y > 0$

Common Logarithm or Brigg's Logarithm

If the base of logarithm is taken as 10 then logarithm is called Common Logarithm or Brigg's Logarithm.

Natural Logarithm

Logarithm having base e is called Napier Logarithm or Natural Logarithm.

Characteristic

The integral part of the logarithm of any number is called the characteristic.

Mantissa

The decimal part of the logarithm of a number is called the mantissa and is always positive.

Rational Expression

The quotient $\frac{P(x)}{Q(x)}$ of two polynomials p(x) and q(x), where q(x) is a non-zero polynomial is called a rational expression.

Surd

An irrational radical with rational radicand is called a surd.

Remainder Theorem

If a polynomial f(x) is divided by a linear divisor (x - a), then the remainder is f(a).

Factor Theorem

The polynomial $(x - a)$ is a factor of the polynomial f(x) if and only if f(a) = 0

Linear Equation in One Variable

A linear equation in one variable x (occurring to the first degree) is an equation of the form

$$ax + b = 0, \text{ where } a, b \in R \text{ and } a \neq 0.$$

Types of Equations

(i) An identity is an equation that is satisfied by every number for which both sides are defined

e.g., $x + 3 = 3 + x$

(ii) A conditional equation is an equation that is satisfied by at least one number but is not an identity,

e.g., $2x + 1 = 9$

(iii) An inconsistent equation is an equation whose solution set is the empty set e.g., $x = x + 5$ because no value of x satisfies it.

Radical Equation

When the variable in an equation occurs under a radical sign, the equations called a radical equation.

Absolute Value of Real Number

The absolute value of a real number 'a' denoted by |a|, is defined as

$$|a| = \begin{cases} a & if\ a > 0 \\ -a, & if\ a < 0 \end{cases}$$

Linear Inequality in One Variable

A linear inequality in one variable x is an inequality in which the variable x occurs only to the first power and is of the form

$$ax + b < 0, \quad a \neq 0$$

where a and b are real numbers. We may replace the symbol $<$ *by* $>$, $<$ *or* $>$.

Line Segment

A part of a line l distinguished or separated by distinct points P and Q of l is said to form a line-segment of l and is denoted by $\overline{PQ}$ or $\overline{QP}$

Coordinates of a Point

The real numbers x, y of the ordered pair (x, y) are called coordinates of a point $P(x, y)$ in a plane. The first number x is called x-coordinate (or abscissa) and the second number y in (x, y) is called y-coordinate (or ordinate) of the point $P(x, y)$.

Distant formula

The distance between two points $P(x_1, y_1)$ and $Q(x_2, y_2)$ in the coordinate plane is

$d = \sqrt{|x_2 - x_1|^2 + |y_2 - y_1|^2}$, where d > 0

Collinear or Non-collinear Points

Whenever two or more than two points happen to lie on the same straight line in the plane, they are called collinear points with respect to that line; otherwise they are called non-collinear.

Equilateral Triangle

If the lengths of all the three sides of a triangle are same, then the triangle is called an equilateral triangle.

Isosceles Triangle

Isosceles triangle PQR is a triangle which has two of its sides of equal length while the third side has a different length.

Right Triangle

A right triangle is that in which one of the angles has measure equal to 90°.

Pythagoras' Theorem

In a right angle triangle ABC,

$|AB|^2 = |BC|^2 + |CA|^2$, where Δ ACB = 90°

Scalene Triangle

A triangle is called a scalene triangle if measures of all the three sides are different.

Square

A square is a closed figure in the plane formed by four non-collinear points such that lengths of all sides are equal and measure of each angle is 90°.

Rectangle

A figure formed in the plane by four non-collinear points is called a rectangle if,

(i) its opposite sides are of equal measure,

(ii) its opposite sides are parallel to each other

(iii) the angle at each vertex is of measure of 90°.

Parallelogram

A figure formed by four non-collinear points in the plane is called a I parallelogram if

(i) its opposite sides are of equal measure

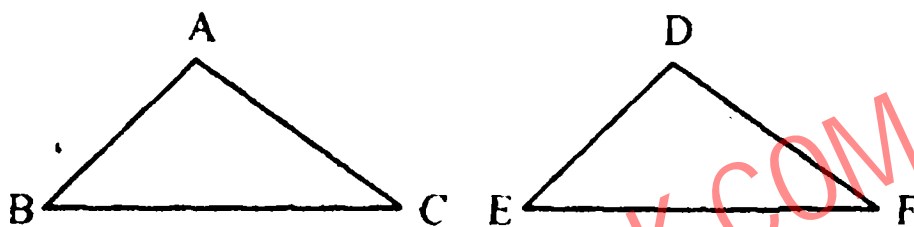
(ii) its opposite sides are parallel

(iii) measure of none of the angles is 90°.

Congruent Triangles

Two triangles are said to be congruent (symbol $\cong$), if there exists a correspondence between them such that all the corresponding sides and angles are congruent i.e.,

If $\begin{cases} \overline{AB} \cong \overline{DE} \\ \overline{BC} \cong \overline{EF} \\ \overline{CA} \cong \overline{FD} \end{cases}$ and $\begin{cases} \angle A \cong \angle D \\ \angle B \cong \angle E \\ \angle C \cong \angle F \end{cases}$

then $\Delta ABC = \Delta DEF$

S.A.S. Postulate

In any correspondence of two triangles, if two sides and their included angle of one triangle are congruent to the corresponding two sides and their included angle of the other, then the triangles are congruent.

Right Bisector of a Line Segment

A line l is called a right bisector of a line segment if l is perpendicular to the line segment and passes through its mid point.

Angle Bisector

Angle bisector is the ray which divides an angle into two equal parts.

Ratio

We define ratio $a : b = r$ as the comparison of two alike quantities a and b, called the terms of a ratio. (Terms must be expressed in the same units).

Proportion

Equality of two ratios is defined as proportion, i.e., if $a : b = c : d$, then a, b, c and d are said to be in proportion.

Similar Triangles

Two (or more) triangles are called similar (symbol ~) if they are equiangular and measures of their corresponding sides are proportional.

Concurrent Lines

Three or more than three lines are said to concurrent, if they all pass through the same point. This common point is called the point of concurrency of lines.

Incentre of a Triangle

The internal bisectors of the angles of a triangle meet at a point called the Incentre of the triangle.

Circumcentre of a Triangle

The point of concurrency of the three perpendicular bisectors of the sides of a triangle is called the circumcentre of the triangle.

Median of a Triangle

A line segment joining a vertex of a triangle to the mid point of the opposite side is called a median of the triangle.

Altitude of a Triangle

A line segment from a vertex of a triangle, perpendicular to the line containing the opposite side, is called an altitude of the triangle.

Orthocentre of a Triangle

The point of concurrency of the three altitudes of a A is called its orthocentre.